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ABSTRACT

This report is a statement of the tentative plans for an interdisciplinary program in document design (effective written communication of ideas to achieve social purposes) at Carnegie-Mellon University. It summarizes the current status of program planning in the following areas: the philosophy underlying the program, the structure of the program, its curriculum design, the needs and specifications for a communication design center for research activities, the core courses of the program, student programs in document design, and student evaluation. Programs at other universities with emphases on rhetoric and cognitive psychology, in which programs in document design might be offered, are discussed. (RL)

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DOCUMENT
DESIGN
PROJECT

Specifications for an Interdisciplinary Program in Document Design

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Preface

This report is a tentative statement of the plans for an interdisciplinary program in document design at CMU. It summarizes the current status of planning by Richard Young and Erwin Steinberg of the English Department and Lee Gregg of Psychology. An announcement of the program was mailed during the first week of November to departments where we expect to find prospective students for the program.

Introduction

C. P. Snow's two cultures come sharply together in attempting to design an interdisciplinary program in document design. The creativity of talented writers, the artistry of graphic design specialists, and the sense of values of the humanist are required to produce documents needed by our society. However, to do this work effectively calls also for skills in analysis and evaluation unique to scientific researchers. The cognitive scientist can help document designers understand the complex writing and reading processes and provide the skills necessary to determine whether or not a document satisfies its intended purposes. The production of documents in our highly technological society also demands the skills of the computer scientist and design engineer.

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Since the problem domain of document design does not exist as a separate field of communications, we are faced with the problem of providing advanced scientific training to students whose prior orientation, education, and experience has led them further and further from quantitative methods and analytical, mechanistic thought. Conversely we must also train others whose interests have been largely scientific to understand the fundamental nature of asthetic design and rhetorical purpose.

Thus, the design of an interdisciplinary program is in part an exercise in reconciling divergent attitudes and approaches. We are gambling on the possibility that it will be feasible to attract and train scientist/designers who can produce high quality documents and conduct effective research on the nature of human understanding.

Philosophy

Interdisciplinary research is usually problem driven, and the problems that give rise to interdisciplinary efforts are usually near the boundaries of traditional disciplines, rather than central to them. As a result, the problems are often valued less highly, and workers at the fringe must overcome a certain amount of disciplinary snobbishness.

A further problem is that, since interdisciplinary research

is often defined by the set of problems addressed, and since problems arise most often in real world contexts, interdisciplinary research is frequently viewed as applied. But academic disciplines value theoretical contributions over solutions to practical problems.

The distinction between pure and applied research, however, is not valid. Some applied problems may require the development of sophisticated models far beyond the isolated ones created in artificial settings. Furthermore, theoretical issues grow out of gaps in knowledge, wherever those gaps may appear. The philosophy of the program in document design is that fundamental knowledge is required to solve complex problems. Our definition of document design suggests that the field is in fact one of the more complex and difficult domains of human endeavor.

The field of document design homes in on a complex human problem solving task--written communication of ideas to achieve social purposes. Since writing is a difficult thing for most people, and good writing is a rare commodity, understanding how and why this is true is a major part of the emerging field of document design.

From these observations, we can summarize the philosophical basis for our program. The major concern of the program will be

research on the writing process as viewed by psychologists who bring methods of cognitive science to bear and by rhetoricians whose work in composing and rhetorical theory is essential to the creation of documents of all sorts.

An important ingredient in the above account of the philosophical underpinnings of document design is the recent development of the field of linguistics. Clearly, the fundamental nature of language, its origins and utilization by human societies, is a very important element in the total definition of the science of document design. Modern linguistic theory has become more analytical and generative than the descriptive theories of the past. Many of the current ideas have influenced the production of artificial languages in computer science and the empirical investigations of cognitive psychologists. Psycholinguistics is the current subarea of cognitive psychology emphasizing the study of human language function.

Two other areas have important connections with the document design task. The field of design, especially graphic design and typography, contributes a basic perspective plus particular principles which must be expanded and related to the writing process. Computer Science is an important area of study because most of the word processing tools and printing devices will be

linked to computers in the future. Together, computer science as represented by artificial intelligence systems and cognitive science concerns can contribute to our understanding of the ways documents can be produced automatically.

We should also say a few words about the educational philosophy of the program. We have noted that students in the program will be engaged in the study of practical document design problems and will do research as an essential part of the degree program. The Doctor of Philosophy degree is a research degree. We do not intend to turn out practitioners with the Ph.D. title. There will be an opportunity for practicing document designers in a new master's degree program and in a new track in the existing Doctor of Arts in the CMU English Department.

Finally, we believe that it is better to start with a small program of a few highly selected students. By requiring the students to enter the interdisciplinary program through traditional departments, we can establish and maintain in them a professional identity while they are acquiring what we believe will be a unique set of skills. The amount of preparation required to survive both the requirements of the major department and the interdisciplinary program will not be a major difficulty at CMU since student programs are individually planned.

Structure of the Program

Participating Departments

As now planned, the Department of English and the Department of Psychology are the two departments of the College of Humanities and Social Sciences participating in the program. The Department of Design, in the College of Fine Arts, has no doctoral level programs, and the administrative problems in providing such programs are formidable. Design is a profession. Very little research in design is carried out anywhere except in engineering fields. The department of design has indicated its willingness to contribute to the program, however. Specific courses and interactions will be described in a later section. The Computer Science Department, which does offer a Ph.D., also is in a separate administrative unit of the university, the Mellon Institute of Science. The department will offer certain courses and facilities related to the document design program, and the close cooperation between the Departments of Psychology and Computer Science insures that the educational experiences will be appropriate for this program.

Curriculum Design

Designing an interdisciplinary curriculum involves selecting courses from each of the participating disciplines and creating a

sequence of experiences by which students acquire increasing skill. Our selection in the case of the document design Ph.D. is from Psychology, where the degree is currently offered in a stable framework; from English where the Ph.D. is just now being planned; and from two rather less central disciplines, Design and Computer Science, where the particular skills of interest are viewed as professional rather than scientific contributions.

Currently, students in the Department of Psychology take two or three courses each semester, attend an area seminar, and devote the rest of their time to ongoing research projects. Courses in the Cognitive area cover basic topics in perception, learning, memory, and thinking. These courses also deal with the experimental and theoretical tools of psychological research: information processing approaches to elementary perceptual and memory functions, computer modeling of problem solving and decision making, and quantitative methods and experimental design. Courses in statistical analysis and multivariate methods are available through a separate Department of Statistics. In the second, third, and fourth years of the program, these courses become advanced seminars in such topics as understanding complex problem domains, discourse processes and comprehension, cognitive processes in writing, and others.

The usual format of the area seminars, which meet weekly, is

a report of individual student or faculty research in progress. These seminars add meaning to the requirement that students be actively engaged in research throughout their graduate careers. The single most important determinant of student retention in the Psychology program is the first year paper, reporting on the student's initial laboratory results. The first year paper becomes an "nth" year paper in each succeeding step of the way.

Students in the department can now specialize in Cognitive Psychology, Developmental Psychology, Social Psychology, and Organizational Psychology. In addition, specialties in Human Factors, Educational Psychology, and Artificial Intelligence are possible. Usually, a doctoral candidate will exhibit depth in one of the four main areas and demonstrate breadth in one or two others.

Doctoral students in psychology who want to specialize in document design will take a special set of courses in rhetoric and in design, take internships in the Communications Design Center (see below), and undertake research arising from document design problems for their dissertations.

The Department of English currently offers a Doctor of Arts degree (D.A.). During the past year, however, it has developed two new doctoral programs in rhetoric and composition: a new

track in the D.A. and a Ph.D.

The new D.A. track is designed for people who intend to run

- freshmen English programs, writing skills centers, or remedial writing programs, in community colleges and universities;
- groups or departments of professional and/or technical writers in business or government.

The Ph.D. in Rhetoric will focus on rhetorical theory--especially on theoretical explanations of the cognitive processes at work in the production and understanding of discourse. It is designed for people who want careers in rhetorical research and the teaching of rhetoric and literary theory in departments of English, Rhetoric, Communications, or Speech. There are four components to the program: history of rhetorical theories, development of theory, application of rhetorical theories, and evaluation. Courses in cognitive psychology will be required under some of those rubrics. Students entering the program will be expected to take courses in all four areas. A special option within the program will allow students to specialize in document design by enrolling in a special set of courses in design, taking internships in the Communications Design Center (see below), and undertaking research arising from document design problems for their dissertations.

Communications Design Center

An important ingredient in the educational scheme for document design is the Communications Design Center, which will provide opportunities for interdisciplinary research and thus for internships and dissertation problems for students.

The center will provide focus for the various research activities in document design carried out by faculty in different departments. Since the research will be sponsored, it will support graduate students. By means of a central interdisciplinary committee through the center, we will be able to provide document design students in the interdisciplinary program with advice on courses and experience in a range of problems in document design. The center will seek fundamental knowledge about such problems as: the ways of incorporating principles of graphic design into reports and business communications; ways of generating clear, effective language using principles of linguistics, stylistics and rhetoric to improve documents; and ways of using computer-based word processing and editing systems in the production of documents.

The mechanism of the Communications Design Center will also make it possible to hire special faculty to give courses or seminars in areas of concern beyond those current in the two departments. Outside lecturers in seminars will also be an

important way of stimulating thought and interest by adding breadth to the program.

Core Courses

The danger in designing a curriculum that embraces too broad a range of subjects is that the student becomes involved in the academic acquisition of knowledge instead of the production of new knowledge through research. Too broad a program leads to studying too many frontiers of knowledge in different disciplines, and hence, resting on information that becomes obsolete as the frontiers move. The design problem is to identify areas of critical need; to provide sufficient breadth to assure meaningful solutions; and to develop throughout the graduate program increasing capabilities for significant research contributions.

The emphasis we have chosen is on the writing process itself. This choice maximizes the utilization of skills present in the departments of English and Psychology.

In order to understand how language is used to achieve human goals, courses in rhetorical theory, particularly its history and contemporary development, application, and evaluation, will be the primary responsibility of the Department of English. Courses on the nature of human understanding and the cognitive processes

in writing and reading will be offered by the Psychology Department. Courses in discourse analysis, linguistics, and psycholinguistics will be a joint responsibility.

A basic course covering the principles of design and visual communication, the joint responsibility of faculty in the CMU Design Department and professional designers from the Siegel and Gale firm, will be required of first or second year students. Alan Siegel is Adjunct Associate Professor of Communications Design and will participate in the design and teaching of this course.

Since the technology of document production and word processing depends heavily upon advances in computer systems, students will be expected to acquire skills in the use of computers and text editing programs; and an appropriate course is currently under development. It will be a survey of the ways computers are used in research in rhetoric and will provide a foundation for more specialized uses of computers and programming in research. The computer component is an excellent example of the pedagogical problem posed in designing an interdisciplinary program. Even when students are from the same general field of study, diversity in skills and experience makes it hard to present material at a single meaningful level to the students. Differences in fundamental disciplines assure that students will

exhibit different levels of comprehension of the same material. A course that appears to be a graduate course to one set of students, therefore, may appear as a trivial introduction to others. The computer course, like each of the core courses, will be taught as a fundamental survey of the field. Certain basic skill levels will be determined as thresholds, and the students will be required to attain or surpass these skills as set by the requirements of the home department.

An equally difficult design decision is determining the minimum mathematical and statistical competencies for document design research. Students must become proficient in designing behavioral experiments to test the effectiveness of documents; they must acquire basic skills in modeling complex phenomena; and they need sophisticated quantitative and statistical tools to measure the reactions of particular audiences to particular documents. Certainly, for example, the statistics necessary for content analysis and authorship attribution studies is a prime requirement, as is skill in experimental design and evaluation. The ability to use and create computer-based readability formulas also seems fundamental. Courses for the learning and development of all these skills are available, and the sharpening of these skills will be an integral part of the research internship in the Communications Design Center. Formal courses are already in

place in four appropriate areas. There are special methods and evaluation courses now given by the departments of English and History in connection with the Doctor of Arts programs. Research methods courses and courses in experimental design are given by Psychology. As mentioned earlier, a variety of statistics courses are offered by the Statistics Department at both the graduate and undergraduate level. Finally, there are courses in programming and in artificial intelligence offered by the Computer Science Department. Individual student programs of study will draw on these sources.

Student Programs and Evaluation

The success of an interdisciplinary program like the one described here depends on several factors:

1. The advice students receive about the options and opportunities available to them. (Given such an array of possible statistics courses, how do students find out about them and determine which are suitable for the individual student's level of advancement?)

2. The selection process by which students and their individual educational goals are matched to the program.

3. Timely feedback so that students receive knowledge of the results of their educational efforts.

An interdisciplinary committee governing the Communications Design Center will monitor the work of the students in the

program. The committee will select students from among the applications, assign a three person committee to oversee each student's supervised research activities, recommend and support the development of new courses, make sure that information about current courses is published, and, perhaps most important of all, approve graduate student programs and the proposed methods for evaluating student progress.

Student evaluation is particularly important. Left to their own devices, students will tend to put off requirements viewed as difficult or irrelevant. On their part, faculty members will tend to delay final judgment. Given that programs must be individually planned for the diverse backgrounds of the students, a major responsibility of the committee will be to maintain quality and assure fair treatment of all students in the program.

As a policy matter, one heuristic for student admissions is to accept only students who are clearly qualified, from an academic point of view, to complete the course requirements. This means that we will be able to screen students on the basis of prior academic success, aptitude, and preparation. Thus the only reason for a student's not completing the program should be a lack of interest in the particular field or motivation to complete the courses and other requirements.

Tentative admissions criteria should be a combined score of 1200 on the GRE verbal and quantitative aptitude tests, a grade point average of 3.5 or above from an accredited college or university, and appropriate letters of recommendation from persons who are qualified to judge the academic performance of students.

We expect that students entering the program will complete the Ph.D. in four years. The average number of students at any time will be 20. We are prepared to accept 8 new students per year. A group of that size will make it possible to offer courses specially designed for the program every other year. By the end of the third year, students should have completed course requirements for the home department and the set of core courses in document design and should have acquired the necessary skills for conducting an original dissertation study.

Courses

A program for a candidate for the Ph.D. in Rhetoric would be built largely from the following sets of courses:

History
  History of Rhetoric (Plato to Wilson)
  History of Rhetoric (Bacon to Coleridge)
Theory Development
  Contemporary Theories of Invention
  Process of Composing
  Process of Reading

Application
- Approaches to Lit. (Classical Rhetoric)
- Course Design
- Seminar on Teaching (with internship) -- two semesters
- Approaches to Lit. (e.g., Burke, Richards, tagmemics, Booth)

Evaluation
- Quantitative Methods
- Methods of Evaluation
- Research Methods (with internships)

Grammar, Logic & Related Studies
- Logic (classical to Toulmin)
- Intro. to Linguistic Analysis
- Text Editing
- Stylistics
- Intro. to Computer Studies
- Discourse Analysis
- Psycholinguistics
- Cognitive Psychology

Internship
- Classical or Vitalist Rhetoric -- two semesters
- Communication Design Center (team project) -- two semesters

Elective courses (for illustrative purposes only)
History of the Language, Epistemology, Philosophy of Plato and Aristotle (Descartes, Heidegger, Kant, Sartre, etc.) Creative Writing, Language and Thought, Learning and Memory, Socio-linguistics, Literary Criticism, Critical Analysis of Non-fictional Literature, Non-Western Rhetoric, Romantic Poets, Approaches to Literature, etc.

Interdisciplinary option in communications design

Courses
- Statistical Analysis
- Principles of Design
- Visual Communication

Elective Internship

An internship in the Communication Skills Center may be taken for three hours of elective credit. The internship would include formal instruction in error analysis, pedagogical methods and writing center administration.

A similar list of courses for a student entering through the Psychology Department would look like the following:

- Cognitive Psychology
  - Cognitive Processes and Problem Solving
  - Learning and Memory
  - Perceptual Processes
  - Psycholinguistics
- Advanced seminars
  - Cognitive Processes in Writing (Process of Composing)
  - Reading (Process of Reading)
  - Artificial Intelligence (Elementary Information Processing)
- Seminar in teaching
- Quantitative Methods
  - Research Designs
  - Supervised Research (3 credit hours or more each semester)
  - Various statistics courses
- Interdisciplinary option in communications design
  - Rhetoric, Grammar, Logic
    - History of Rhetoric
    - Contemporary Theories of Invention
    - Stylistics
    - Discourse Analysis
    - Linguistic Analysis
  - Related Studies
    - Principles of Design
    - Visual Communications
    - Introduction to Computer Studies
    - Text Editing
  - Breadth Courses in Psychology
    - Social Psychology
    - Cognitive Psychology
    - Social Cognition
    - Neuropsychology

Currently, work is underway on the courses in Stylistics, Principles of Design, Visual Communication, and Computer Studies. Many of the other courses exist in the current programs. However, a great deal of coordination and joint planning still

remains.

Other Universities

We have just described a program that draws primarily on the strengths of two departments at CMU to define a new program in document design. From an examination of the courses and the emphasis placed on rhetoric and cognitive psychology, the unique nature of the program emerges. A graphics designer, publisher, or typographer/printer might ask, where is the design in document design?

Certainly, the design aspects are not stressed in the CMU program. Perhaps at another university where empirical research in the graphics design area is undertaken, we might expect a somewhat different variant of the program. Unlike the fields of cognitive psychology, linguistics, and rhetoric, there is relatively little empirical research in graphic design. Professional schools of design, like the one at CMU, have a very different approach to solving problems from the approach of the scientific disciplines. Designers usually propose several solutions to problems or subproblems and choose among the solutions at each stage according to generally accepted rules, stylistic preferences, or judgments of fit. Furthermore, the generation of the solutions tends to be wholistic rather than

synthetic.

Are there other universities where a graduate program in document design might be offered? Our search for related programs or places where a program like the one proposed here produced three kinds of clusters. First, there are schools with strong communications programs grounded in good departments of speech or linguistics. These tend to be midwest land grant colleges. However, these universities lack cognitive psychology and the flexible administrative structure an interdisciplinary program requires. Examples of the schools in this category are Iowa, Wisconsin, Michigan State, Penn State, and Illinois. Some of these universities are so large that within a single department a reasonably broad range of document design activities could be dealt with. The best rhetoric programs are located at Iowa (Samuel Becker), the University of Southern California (James McBath), and the University of California at Berkeley (William Brandt). There is a specialized program in rhetoric (Robert Elmer) at Rensselaer Polytechnic Institute and a program in computer graphics (Michael J. Wozny) that is very interesting.

The second group of institutions appear to have strength in the design area. However, they too lack either the psychological component or the rhetorical emphasis. Examples of these schools are Harvard, MIT, and UCLA.

Finally, we can identify a few schols where several of the basic disciplines are represented. Three institutions are on the West Coast: the University of Washington at Seattle, UC Santa Barbara, and UC San Diego. There are two universities in the Southwest: Colorado and Texas. At each of these schools, there are two or more psychologists whose interests touch upon the document design field: at the University of Washington, there are Elizabeth Loftus and Earl Hunt; at Santa Barbara, John Cotton and Russell Revlin; and at San Diego, Don Norman and David Rumelhart. At the University of Colorado, Walter Kintsch and Peter Polson are the relevant psychologists, and at the University of Texas, Donald Foss and Philip Gough. In the East, Yale University has a strong school of design (Alvin Eisenman) and an excellent combination of psychology and artificial intelligence. These universities have a heavy emphasis on the kind of applied cognitive psychology that is basic to the document design program. (See the appendices for the addresses of the people mentioned above and a summary of the best programs.)

Appendix A

Addresses

Samuel L. Becker
Dept. of Speech and Dramatic Art
University of Iowa
Iowa City, IA 52242

William J. Brandt
Dept. of Rhetoric
University of California
Berkeley, CA 94720

John W. Cotton
Dept. of Education
University of California
Santa Barbara, CA 93106

Alvin Eisenman
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Yale University
212 York St.
New Haven, CT 06520

Robert W. Elmer
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Rensselaer Polytechnic Institute
Troy, NY 12181

Appendix B

Strong Programs

	Cog.Psych.	Design	Rhet./Comm.
Harvard		x	
MIT		x	
Rensselaer			x
Univ. of CA--Berkeley			x
Univ. of CA--Los Angeles		x	
Univ. of CA--San Diego	x		
Univ. of CA--Santa Barbara	x		
Univ. of Colorado	x		
Univ. of Illinois			x
Univ. of Iowa			x
Univ. of Michigan			x
Univ. of Pennsylvania			x
Univ. of S. California			x
Univ. of Texas	x		
Univ. of WA--Seattle	x		
Univ. of Wisconsin			x
Yale	x	x	